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CLIMATIC CONDITIONS IN SOUTHERN CALIFORNIA

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THE contrast in atmospheric conditions during the winter in Southern California and the eastern United States is very striking. In the humid east nature is under the spell of frost, and plant life is dormant. All human activities and pursuits are in keeping with the controlling temperatures.

At this same season nature works differently in Southern California. The trees are in full foliage. Roses, geraniums, violets, carnations, callas, and countless other flowers are blooming in the open air. The atmosphere is heavy with the scent of orange blossoms. Overhead is a soft, blue dome which arches down behind alluring mountains, or dips under the silent sea. This is the "rainy season," yet the sun shines brightly most of the time, and picnics, tallyho parties, and mountain climbing are the order of the day.

No less striking is the contrast between the summer conditions in Southern California and those of the East. Instead of sweltering days and uncomfortable nights, the day temperatures are always modified by the sea breezes, and the nights are almost invariably cool.

A knowledge of the position and the topography of Southern California will make clear the reasons for these striking climatic conditions. As is well known, west coasts in temperate latitudes

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have a more equable climate than have east coasts. The prevailing westerlies bring to these shores ocean temperatures, while to the opposite shores they carry land temperatures. Looking at an isothermal chart of the United States we see that each mean annual isotherm crosses the western coast in somewhat higher latitudes than the eastern coast. Southern California is a region which is topographically cut off from the rest of the states and from the great continent to the eastward.

The enclosing walls of the great central valley of California, the Sierras and the Coast mountains, merge in the neighborhood of the Tahichipi Pass, and the Sierras swing off in a curve following a general southeasterly direction. The Coast ranges turn sharply to the east at about the 35th parallel and join with the eastern mountain wall as before stated. The Sierra de San Rafael, the Santa Inez, the Tahichipi and the San Fernando mountains form the natural boundary between the interior valley of California and the southern portion of the state. Thus most of Southern California faces the sea and the sun, having a south and west slope.

East and north of the San Bernardino mountains, which are about seventy-five miles east of Los Angeles, and west of the Colorado river, is the great desert region of California, best seen in the Mojave desert in the north and about Yuma, Ariz., in the south. Small portions of these deserts are below sea level. The whole area is heated to a high temperature during the summer, and the indraught from the sea is thus greatly strengthened.

Farther east lie the great plateau and arid regions of Arizona and New Mexico. Because of the high summer temperatures of these desert areas, the prevailing westerlies have no moisture during the summer, for they strike as surface currents farther to the north. During the winter the land is cooled sufficiently to cause the moisture to be taken from them. Thus we have two, instead of four seasons.

Temperature Conditions.—Since Southern California has such a diversified topography there is naturally a great variation in temperature. The conditions existing in the vicinity of Los Angeles will be taken up in particular and conditions in other portions treated incidentally. Simply for the sake of comparison, reference will be made to temperature and other climatic conditions in portions of the East.

The average annual temperature at Los Angeles is 61.4° Fahrenheit. At San Diego, 60.7°; at Chicago, 48.3°. The average tem-

perature during the month of January is 53.1°, during August 70.4°, the mean seasonal range is therefore but 17°. The average temperature at Chicago during January is 23.4°, during July 72.1°. This gives a seasonal range of 48.6°. The average January temperature at New York is 30.5°, the average July temperature 73.5°. Here we have a seasonal range of 43°.

The minimum temperature ever recorded in Los Angeles is 28°. This occurred in February, 1883. The mercury has fallen below 32° but eight times since 1887. The lowest temperature ever recorded at San Diego is 32°; at San Luis Obispo 25°. The minimum temperature recorded in Chicago is —20°; this occurred on January 9, 1875. The maximum temperature observed at Los Angeles is 109°, July 25, 1891. The mercury has stood at 100° or over but twenty times since 1887. The maximum at San Diego is 101°, at San Luis Obispo 106°. The maximum for Chicago is 103°. This was reached on July 21, 1901.

Although the seasonal ranges are very slight in Southern California, the daily ranges are marked. A wrap is nearly always needed in the evening, no matter how warm it may have been during the day.

In comparing temperatures in California and in the East the differences in relative humidity must be kept in mind. Owing to the dryness, a temperature of 100° in Los Angeles is not so oppressive as a temperature of 85° in the middle west or on the Atlantic coast.

On the lowlands frost rarely causes any damage. The mesas are generally "frostless belts" and here fruits and vegetables particularly susceptible to cold are raised.

With sunshine and flowers in the valley one can often see on the mountains a generous coating of snow. At altitudes less than 7,000 feet it remains but a very short time. On the northern slope of the highest peaks it remains nearly all of the year.

Humidity is a very important factor in climate. Heat and cold are very effective when accompanied by high relative humidity. In Southern California the days are usually bright and clear. The normal sunshine is from 60 to 70 per cent. near the coast and higher in the interior. In Chicago it is from 40 to 50 per cent., and in New York the same. Fogs are frequent along the coast, but they generally disappear by ten A. M. Over and over again we have bright sunny mornings at Pasadena, when on the lowlands two miles to the south there is a heavy fog. Fogs are not frequent on the hills

and mesas, and therefore the sanitariums are usually placed in such situations.

The amount of precipitation varies greatly even in short distances, owing to the variation in the surface features. On October 26, 1901, rain fell at Pasadena to the amount of 2.50 inches, while at Los Angeles the precipitation amounted to but 1.88 inches, and at San Diego to .24 inches. In the mountains a few miles north of Pasadena as much as 4.00 inches fell. On November 10, .46 of an inch of rain fell at Los Angeles, and nearly an inch at Pasadena. On each of the above dates snow fell on the summit of Mount Baldy (altitude 10,185 feet), but remained a very short time. The average annual precipitation at Los Angeles is 15.71 inches. This

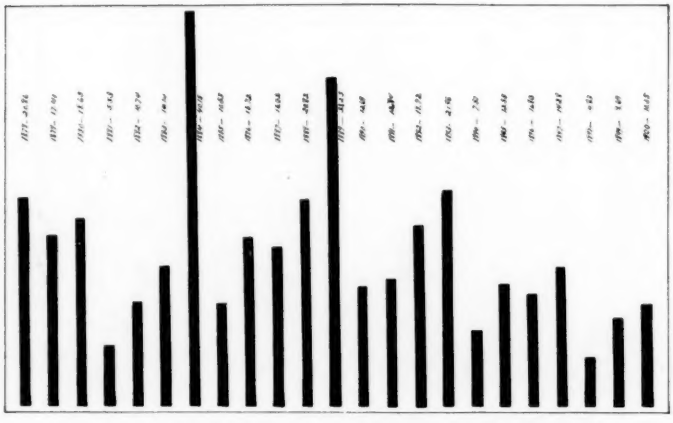

FIG. 1. PRECIPITATION AT LOS ANGELES BY YEARS 1878-1900.

covers the period between 1878 and 1900. Figure 1 shows that a series of "dry" seasons is followed by one or more of considerable rainfall. The banner year was 1884, when 40.15 inches fell. The diagram further shows that in so far as actual recorded observation goes, there is no ground whatever for the opinion so often expressed, that California is becoming more arid.

The diagram showing the precipitation by months (Fig. 2) indicates clearly the divisions of the year into its wet and dry seasons. We also see that some rain falls during the dry months, although this is not a regular occurrence.

At San Luis Obispo the average annual rainfall is about 17.50

inches, at San Diego 10 inches, while on the Colorado desert it is less than 5 inches. (See Figure 3.)

The "lows" generally cut the coast in the neighborhood of Puget Sound, and then move in a general easterly direction. If the path of the low extends far enough to the south rain falls throughout the extent of the California coast. Very frequently the storm area moves eastward in the neighborhood of the Tahichipi mountains. In consequence of this eastward deflection northern California receives much more precipitation than does the southern end of the state. The raisin producers of Fresno County derive very great benefit from the work of the Weather Bureau, and whenever a storm is predicted they cover the grapes and so reduce the loss to a minimum.

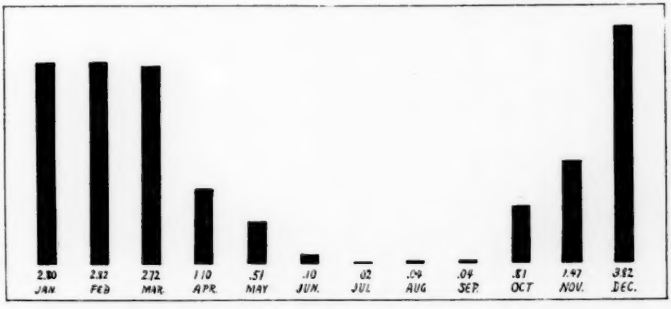

FIG. 2. AVERAGE MONTHLY PRECIPITATION AT LOS ANGELES 1878–1890.

It is seldom that more than one inch of rain falls during a single storm, although sometimes this is greatly exceeded, as was the case in November, 1900, and on October 26, 1901. "Cloud bursts" in the mountains often result in four or five inches of rain. Thunderstorms are practically unknown in the valleys. In eight years I have not heard a single loud peal of thunder, although rumbles are heard in the direction of the mountains several times each winter.

About the last of April the rains cease except for a stray shower which may work its way into the dry season. During the next six months the land enjoys almost continuous sunshine. By the middle of June uncultivated lands, unless they support timber, are brown and bare. The streams show a marked decrease in volume, and many have ceased to flow upon the surface. The orchardist must

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now depend upon irrigation to insure a crop. This applies only to citrous fruit, however, as deciduous orchards and vineyards are not irrigated.

The greater number of those who visit the state come during the winter months, and finding that warm sunshiny weather is the rule, argue that Southern California must be very hot in the summer. As a matter of fact, the summer climate, owing to the sea breezes and the dryness of the atmosphere, is delightful. Strong winds, which are such an objectionable feature in many places, are here seldom felt. Occasionally in November or December a wind storm occurs, bringing from the desert region to the east a cloud of fine sand. The average velocity of the wind at Los Angeles is 5 miles per hour, while in Chicago and New York it is 9 miles per hour. The highest velocity recorded for a period of five minutes is 48 miles per hour, while the corresponding figures for Chicago are 84 and for New York 74.

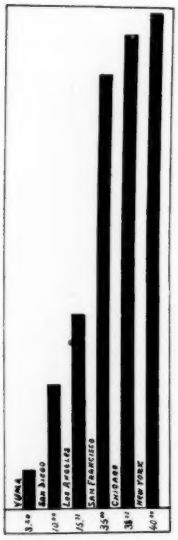

FIG. 3. MEAN ANNUAL PRECIPITATION IN SEVERAL CITIES.

The influence of climate upon the life of man is well illustrated in Southern California. Twenty-five years ago this region was little more than a great range for numberless herds of cattle. The old Spanish life was much in evidence, and there was little of the push and enterprise which is so apparent at the present time. In 1890 the population of Los Angeles was 50,000, while in 1900 it was 103,000. This marvellous growth, not equalled in any city in the United States during the same period, was achieved in the face of the great financial depression which prevailed throughout the land. The cause of the wonderful development of Southern California lies first of all in her unexcelled climate. People suffering from this or that ailment, or tired of the rigors of eastern winters, have come to this southland, and to come means in very many cases to stay.

As a rule people who travel are possessed of some means and culture, and thus a very desirable class of people is each year added to the population. One finds in every section of this country men and women of refinement filling positions of all kinds. More good books and periodicals are read in proportion to the population than in any other part of the United States.

As a direct result of climatic conditions we find that agriculture differs from the same occupation in the East. Oranges, lemons, grape-fruit, figs, grapes, peaches, apricots, and countless other fruits engage the attention of the tiller of the soil. These crops bring larger returns than do wheat, corn, or potatoes. Weather conditions are such that the farmer can work during the entire year, and always have some crop to market. In addition to this there is more pleasure in fruit culture than in raising the ordinary farm products. Thus various causes have conspired to give California a rural population above the average in intelligence.

The climate has, and properly so, a decided influence on the value of real property. Just as one is willing to pay for comforts in a house, so people are willing to pay a larger price for land which is located in a region of almost continuous sunshine and moderate temperature. If deep blue skies and inspiring landscapes are important factors in producing writers and artists, then we may rightly expect Southern California to contribute much along these lines when she shall have reached her maturity.

POSTGLACIAL ORIGIN AND MIGRATIONS OF THE LIFE OF THE NORTHEASTERN UNITED STATES

I

BY CHARLES C. ADAMS.

I. THE DISPERSAL AND MIGRATIONS OF LIFE.

HUMAN history shows very plainly that in the bygone ages different races and tribes of men have been very restless and prone to wander about. One race after another has pushed onward, far from its ancient home, and waged war upon other tribes, to conquer or be conquered. On account of this jostling about of human races the social complexion of a region or nation may be very involved. The population, on account of the successive invasions of different races, and their consequent mixing, may be composed of elements, very diverse with regard to the direction of their geographic origin, as is seen in our large cities. Thus the popu-

lation of a region may be considered as a mosaic or mixture (depending upon its degree of organization) of very different elements.

Now some one may inquire, what has all this to do with geographical origin and migrations of the plants and animals of the northeastern United States? The fact is, the relation is more real than is apparent at first glance, because very nearly the same principles are involved in the distribution and geographic origin of man that are involved in the case of the other animals and the plants. We are most familiar with these fluctuations in the case of human affairs, but this moving about is none the less true for all the rest of the living world. The struggle for new territory is not perhaps as apparent as in the case of man, nor does it attract so much direct attention, but it is none the less real and all-pervading. It is not only true that the human population of a region may be, and usually is, of diverse origin; but the same law holds with equal validity in the plant and animal population of any given region. The apparent abruptness of the transition with regard to their method and means of dispersal, from man to the lower animals, is bridged over somewhat if we consider as an intermediate class the domestic plants and animals, the weeds and vermin, which follow man in all his travels.

In considering the spreading or dispersal of life we may take two distinct points of view: either the "convergent" or the "divergent." We have already called attention to the "divergent" view, or the dispersal of life from its ancient home; and from this standpoint the causes and means of dispersal are emphasized. From what may be called the "convergent" standpoint, life is considered as it converges toward, or comes into, a region from various directions; and in such cases attention is turned especially to the direction of geographical origin and the highways by which the life has come into the region.

In the present paper we wish to consider the forms of life found in the northeastern United States, north of the Ohio River and east of the Great Plains, in order to obtain some idea, if possible, as to their geographic origin and migrations. For this reason we must consider the subject from both points of view; but before we discuss the main point in detail it will be well to examine a few of the most conspicuous causes and means of dispersal of plants and animals which have been factors in the present problem.

For animals especially, overcrowding should be mentioned. As a rule, more young are produced in a given region than are able to mature. This necessarily leads to a struggle; and here, as elsewhere,

the sharpest competition is between those organisms which have the same needs and desires; and hence the strife is between those forms which are most alike or closely related. To be sure, overcrowding leads to migration of those kinds of organisms only which are able to move about. In the case of plants which are rooted to the soil and hence cannot migrate, there are other means of dispersal which make it possible for seeds to reach unoccupied territory. These means of dispersal (by winds, animals, etc.), work rapidly, and their influence is best known because it becomes apparent in a very short time. On the other hand there are some factors which work very slowly, and yet in the course of time are able to bring about almost unlimited changes. Reference is here made to changes in the climate or topography of a region.

In considering any cause of dispersal, such as overcrowding, climatic or topographic changes, we must bear in mind that the habitat, and the necessary physical conditions of life, must lead. In overcrowding, the fundamental idea is that the only available habitat lies at the unoccupied margin. Thus seeds may fall on both the crowded and the unoccupied territory, but it is primarily only those which fall on the unoccupied territory which survive; and thus when the habitat is expanding in a definite direction, the plant is led into new territory.

The change of climate at a given place is a very important cause of dispersal. Aside from seasonal changes, this factor works slowly, and may be complicated by physiographic changes. At present we do not wish to consider seasonal changes. In trying to understand the geographic origin of the life of northeastern North America, much attention must be given to a great change in climate which brought about an absolute and complete change of the life of this region. This great change doubtless produced a more marked contrast in the life of this region than now exists between that of the Gulf States and that of Labrador. Perhaps a greater change in climate has never taken place during the history of life upon our planet.

This subject can only be touched upon here very briefly and the main points for us to consider are somewhat as follows: Within comparatively recent times, geologically speaking, that is within the lifetime of many existing genera, the climate of eastern North America was much warmer than at present, and a fauna and flora somewhat similar to that of the southern states extended far to the north. The climate finally began to lose its congenial character and continued to do so until it could no longer be described by any other

term than arctic. About the same time a huge glacier, perhaps several thousand feet thick, came creeping down from the north, grinding to pieces everything beneath its awful weight, and allowing

THE NORTH AMERICAN ICESHEET AT TIME OF MAXIMUM DEVELOPMENT. REPRODUCED BY PERMISSION OF PROF. R. D. SALISBURY.

mainly arctic life to survive near its margin. The extreme southern limit was not uniformly maintained, for there was a considerable

fluctuation at different times, though the last extension was not the maximum one. Twice, at least, the ice retreated far to the north, but only to return again, as is shown by the presence of southern plant and animal remains in the Interglacial beds of Toronto. The maximum southern limit of this sheet is shown in the accompanying plate. A knowledge of these fluctuations is not necessary to an understanding of the Postglacial migrations. Finally the ice retreated far to the north and permitted life from the south to move into the newly opened territory. We are thus enabled to see that, save some boreal forms, the whole animal and plant population of the northeastern United States is of Postglacial origin.

But what has become of the life in the region before the ice advanced? This is a very important question and one to which students have given but little attention. Some seem inclined to think that most of the temperate life was driven very far beyond the edge of the ice sheet, even to the Gulf Coast. Yet there is evidence which apparently does not favor this extreme view, and seems to indicate that south of the Ohio during the ice age there was a diversified temperate flora and fauna. It is one of the fundamental laws of the distribution of life that closely related forms originally occupy continuously the area over which they are dispersed. That is, they are not isolated from one another by any considerable space, but occupy continuously a certain region. When an animal, for example, is found at some considerable distance from others of the same kind and absent from the intervening region. its distribution is said to be discontinuous. Under such conditions, unless the animal has exceptional means of dispersal, it is believed that formerly this intermediate unoccupied region was inhabited by this particular animal; or, in other words, discontinuous forms were once continuous in their distribution. There is still another very important element in the flora and fauna which must be considered, and that is those forms found in the southeast and whose nearest relatives occur in Japan and eastern Asia, but not in the intervening region. These are the relicts or remnants of a preglacial flora and fauna, which were formerly connected at the north and were driven asunder by the onward march of the ice. These relicts include not only a large number of our characteristic deciduous trees and herbaceous plants, but also a variety of animals, for example, certain fish and river mussels.

There is still another alternative, and that is the two forms have arisen independently. This does not seem altogether improbable in

some particular cases; but that a large number of genera and species should do so at the same time and place does seem improbable. The occurrence of a large number of plants and animals in the southeastern United States which do not occur elsewhere excepting in limited number and variety, indicates that perhaps this region was one of origin, as well as of preservation of life during the Ice Age. From the foregoing we see that while the northeastern United States lay deeply buried under a mantle of ice, in the southeastern states beyond the glacier's frigid influence, deciduous forests flourished; while in the streams there were mussels and crayfish which had eastern Asiatic affinities. There were still other forms which seem to have originated in the southeast and to have reached their greatest development in that region, only a few having spread from it.

These facts may be summarized as follows:

First. The evident spreading or migrations noticed in the case of man are equally characteristic in all other forms of life.

Second. The present life of any region is a *mosaic* composed of elements from all possible directions.

Third. There are numerous means of dispersal: free forms migrate; stationary forms have special means. The habitat, or climate itself changing, causes forms to spread into new territory, as was the case in the Ice Age.

Fourth. The original plant and animal population of the northeastern United States was cleared away by the advance of the glacial ice, many forms taking refuge in the southeastern States.

Fifth. The present life of the northeastern United States is of postglacial origin primarily.

This now leads us to our main point, since we have now briefly considered the antecedents which are necessary as a background to an understanding of the geographic origin and migrations of the life of the northeastern United States. The present must be interpreted in terms of the past.

II. POSTGLACIAL ORIGIN AND MIGRATIONS OF LIFE.

With the final retreat of the ice to the far north, and the return of a mild climate to the glaciated region, temperate forms of life again pushed back into the open territory. The glacial retreat was doubtless gradual and left behind it no unoccupied territory, because the temperate forms pushed close upon the rear of the arctic ones, which fringed as a zone the edge of the ice. Under such circumstances there are many advantages to those favorably located, and accordingly the first wave of life which became dispersed over the

glaciated region was the distinctly glacial fauna and flora which skirted the border of the ice-sheet. The present living analogue of this first wave is the barren ground, lichen and moss, types of the far north. Hardly a trace now remains in the eastern United States of this pioneer class, and this class is now restricted to very limited areas or mountain top "islands" as in the White mountains. The present distribution of these arctic-alpine "islands" brings up a number of very interesting points. How is it that these alpine plants and animals are now found so far south and only upon high mountain peaks? This question could not be rationally explained until the influence of the Ice Age upon life became recognized, and would indeed be a difficult one to answer if we did not take into consideration past conditions of climate and topography. We must recall that the arctic conditions which now occur, outside of the arctic regions, only on high mountain tops, at that time extended to the very base of the mountains; and as the ice retreated to the north, this cold zone gradually moved up the sides of the mountains, carrying with it a characteristic flora and fauna. Thus with the retreat of the ice the first wave of life had two evident posibilities before it: *first,* to follow the ice north, or to follow the cold zone up the mountains. By this means small colonies of arctic plants and animals became separated from the main body of forms, and thus became alpine. To be sure this segregation could occur only where the mountain peaks are isolated. If the mountains had been of sufficient height and had extended far to the north, a highway would have been retained to the original stock and thus the distribution would not have become discontinuous. From the above interpretation it seems fair to conclude that the arctic forms which now occur at alpine heights are *relicts* of the former widespread glacial fauna and flora, whose distribution has become discontinuous by a change of climate.

The next general class of plants and animals which followed close upon this arctic element is that which makes up the second wave. This corresponds approximately to the present subarctic life in the north and the subalpine on mountains, below the tree line. It should be clearly understood that these classes or waves are only intended to apply in a general way and are not sharply defined. The best idea of this second wave may be gained by considering the life of the coniferous zone of Canada. Along its northern limit the trees are stunted willows, birches, and alders; and farther south spruce, larch, hemlock, and pines, are the representative trees. This is the zone of fur-bearing animals. In swampy places a dense growth of

sphagnum mosses covers the surface like a thick soft mat. This same type of coniferous forests is well developed in the northern Appalachian mountains. In this particular case on account of the direction and height of the mountains, the distribution of this type of life is much more continuous than in the case of the arctic-alpine forms; and, unlike the first forms, we have small relict "islands" of second wave types in *swamps* or on *sand dunes*. The swamps have been called "boreal islands," on account of their discontinuity and their being composed of northern forms which are surrounded by more southern types of plants and animals. There is a fairly distinct zone in the glaciated region in which these "islands" mainly occur, although they are not confined to the glaciated country exclusively. The topographic effect of glaciation very often favors the formation of lakes which, as they fill up, become ponds and marshes; and it is in this zone that these "boreal islands" occur most abundantly at present. The two waves of life which we have just been considering are types very distinctly adapted to a cold or cool climate, such as is found either in high latitudes or high altitudes.

The third wave was of a more temperate type and followed farther in the rear of the ice. This wave is represented by the dominant types of life to-day found occupying Illinois, Indiana, and Ohio. It was a wave of deciduous shrubs and trees, oaks, hickories, elms, locusts, haws, and a host of others, and of abundant animal life, insects, molluses, amphibians, birds, and forest-inhabiting mammals.

THE RELATIVE HUMIDITY OF OUR HOUSES IN WINTER*

BY ROBERT DEC. WARD, ASSOCIATE PROFESSOR OF CLIMATOLOGY, HARVARD UNIVERSITY.

IN discussing with my classes in climatology the various ways in which climatic conditions affect man, I have been accustomed to point out that, in our efforts to protect ourselves against the weather, we have managed to produce an extremely artificial climate inside of our modern houses. We shut out the winds and live in an

* This article was originally published in the *Boston Medical and Surgical Journal*, for March 1, 1900. It has been revised for publication in this JOURNAL at the request of the *Editors*.—R. DeC. W.

atmosphere which is prevailing calm. We keep out rain, snow, sleet, hail, and thus live most of the time where there is never any precipitation. In summer we are able to keep the air in our houses cooler than that outside by closing windows and blinds, and by means of artificial ventilation. In winter our houses are heated, and we live in an atmosphere which is many degrees warmer, and also much drier, than that out of doors. This aridity of the air indoors in winter I have been in the habit of comparing with that of deserts, although until recently I have used no numerical data in making this comparison. In view of the importance of this matter from a physiological point of view, and also because of my desire to present my students with humidity data obtained by actual observation indoors, I made a short series of simple observations along these lines about two years ago, which may have some interest for the readers of the JOURNAL.

It is well known that our bodies are not thermometers. They do not indicate, by our sensations of heat or cold, just what is the temperature of the surrounding air; but they try to adjust themselves to the conditions in which they happen to be placed. This adjustment depends upon many other factors than the air temperature. Thus humidity of the air, the movement of the air, the temperature and proximity of surrounding objects, the physical condition of the body, the clothing, the occupation, etc., all play a part in this adjustment. The first of these factors—the humidity—is perhaps of the greatest importance. The drier the atmosphere, the greater the evaporation from all moist surfaces, including the surface of the body. The process of evaporation needs energy, and this energy often comes from the heat of some neighboring body. When we fan ourselves on a very hot day in summer the evaporation of the moisture on our faces takes away some of the heat from the skin, and we feel cooler. Hence a hot day when the air is comparatively dry is cooler, other things being equal, than a hot day when the air is damp. The temperatures that are felt at the surface of the skin, especially when the skin is exposed, as on the face and hands, have been called *sensible temperatures.* Our sense of comfort in hot weather depends on these *sensible* temperatures. The degree of moisture also affects our feelings of heat or cold through conduction, for moist air is a better conductor than dry air. Hence, with equal degrees of cold indicated by an ordinary thermometer on two winter days, we feel colder, other things being equal, on the day that has the dampest air. The problem is a complex one; it suffices for the present to lay

special emphasis upon the great importance of the relative humidity of the air as affecting our feelings of heat or cold through evaporation.

The observations to which I have referred were made in my study by means of one of H. J. Green's ordinary sling psychrometers. The room in question is heated by hot air, from an ordinary hot-air furnace, provided with the usual small evaporating pan. Inside the register there is a vessel holding a little more than half a litre of water. This pan has to be filled about once a day, although the rapidity of evaporation depends so directly upon the amount of heat from the furnace that the time needed to evaporate the water varies considerably. Observations were made during three weeks of November, 1899 (November 3–23), from two to five times daily, as opportunity offered. The hours of observation necessarily varied. Each record included the readings of wet and dry bulb thermometers, and a note as to the condition of the weather outside; the amount of ventilation by means of the window; the degree of heat coming from the furnace, and the amount of water in the evaporating pan inside the register.

A summary of the mean daily temperatures and relative humidities indoors and outdoors is given below. In the case of the data for

Date.	No. of Observations.	Inside Air.		Outside Air.	
		Mean Temperature.	Mean Relative Humidity.	Mean Temperature.	Mean Relative Humidity.
November 3	5	69°	28 per cent.	35°	66 per cent.
" 4	5	71°	39 "	42°	69 "
" 5	5	71°	30 "	43°	64 "
" 6	4	69°	29 "	34°	68 "
" 7	5	68°	32 "	39°	63 "
" 8	5	71°	31 "	44°	69 "
" 9	4	69°	32 "	42°	69 "
" 10	3	67°	32 "	47°	60 "
" 11	4	69°	33 "	28°	77 "
" 12	3	64°	30 "	23°	70 "
" 13	4	67°	24 "	23°	51 "
" 14	3	67°	26 "	25°	75 "
" 15	3	71°	31 "	28°	91 "
" 16	4	72°	29 "	36°	68 "
" 17	2	68°	27 "	24°	66 "
" 18	2	68°	31 "	28°	90 "
" 19	3	71°	40 "	42°	87 "
" 20	3	70°	28 "	39°	69 "
" 21	4	69°	25 "	41°	70 "
" 22	4	71°	30 "	46°	77 "
" 23	3	72°	26 "	43°	72 "
Means.		69°	30 "	36°	71 "

the outside air the readings were taken from the sheets of the Richard thermograph and hydrograph at the Harvard College Observatory, the hours to which the individual readings correspond being the same as those at which the observations were made indoors. These means for the outside air are therefore not the true means for the day, but they serve for the purposes of the present comparison.

Summarizing the complete tables, which are omitted here for lack of space, we have the following results:

Maximum relative humidity, 45 per cent.; recorded November 4, at 8 A.M. It had been raining during the night, the outside air was very damp, with an easterly wind blowing. The window was partly open and there was but little heat coming from the furnace. The relative humidity outdoors was 92 per cent. These conditions, of damp air outside, open window and small furnace fire, were clearly favorable for giving a high degree of relative humidity indoors. The humidity indoors at noon of this same day was also 45 per cent. The weather at that time was beginning to clear, the wind gradually veering towards northwest. The window was still open.

The minimum relative humidity at any one observation was 21 per cent.; recorded November 23, at 10 A.M. Weather clear; northwest wind, moderate; windows shut and good supply of heat from the furnace. The relative humidity outdoors was 68 per cent.

The maximum relative humidity for a whole day was 40 per cent.; recorded November 19. The day was overcast, damp and rainy; window open throughout the day, and moderate heat from furnace. The relative humidity outdoors averaged 87 per cent., which was exceeded on two days only, namely, November 15, with 91 per cent., and November 18, with 90 per cent.

The minimum relative humidity for a whole day was 24 per cent.; recorded November 13. The day was clear and cold, with a moderate to brisk northwest wind. The windows were shut most of the day and the temperature of the room averaged 67°. The relative humidity outside on this day averaged 51 per cent., which was the minimum for any whole day during the period of observation.

The mean relative humidity indoors for the whole period was 30 per cent. The mean relative humidity of the outside air during the same period was 71 per cent., or 41 per cent. in excess of that indoors.

The relative humidity in a room is clearly the resultant of several variables, among which are the temperature and humidity outdoors; the amount of heat coming from the furnace; the amount of evapora-

tion from the evaporating pans; the extent to which the room receives the outside air through the open windows, etc. It was hoped, as one result of the present study, to be able to determine roughly the relative importance of some of these different factors, especially of the effect of varying amounts of water evaporated from the evaporating pans; but this was found to be impossible under the conditions of the investigation. It appears, nevertheless, from an examination of the data, that the relation between the relative humidity of the air outside and inside is fairly close, increasing relative humidity outside being closely followed by increasing humidity indoors, and *vice versa*. The weather conditions during which the absolute maximum of 45 per cent. and the daily maximum of 40 per cent. noted were, as has been seen, precisely such as would have led one to expect high humidity indoors. On the other hand, the northwest wind with its dry, clear weather, which prevailed when the daily mean of 24 per cent. occurred, naturally preceded and accompanied low relative humidity indoors. These same relations appear distinctly on a good many of the days during which the observations were made.

In one case (November 4), a change of wind from southeast to northwest, accompanied by clearing weather, was closely followed by a decrease in relative humidity of 34 per cent. outdoors and of 6 per cent. indoors. In another case (November 11), a change of wind to the east, with rain, brought a rise in relative humidity of 15 per cent. outside and of 6 per cent. indoors. On a third occasion (November 12), when a rainy day was followed by a clearing day with northwest wind, the relative humidity fell steadily from 32 per cent. at 8 A.M., to 30 per cent. at noon, and 28 per cent. at 6 P.M., the decreasing humidity keeping pace with the decreasing cloudiness and increasing velocity of the dry northwest wind. The relative humidity outside fell from 78 per cent. at the first observation to 69 per cent. at the second and 63 per cent. at the third. The windows were closed at the time of all the above changes.

Now the interesting question is: How did the relative humidity indoors compare with that of other places outdoors? It has been seen that the mean relative humidity in Cambridge during the twenty-one days of observation was 71 per cent. The mean relative humidity in Boston for the year 1899 was 69 per cent., and for the month of November, 1899, 68.8 per cent. For almost all of the United States east of the Mississippi river the normal annual relative humidity is between 70 per cent. and 80 per cent., and it is only in the southwest (New Mexico, Arizona, and southern Nevada, Utah,

and Colorado), that the annual mean is below 50 per cent.* The lowest mean annual relative humidities in the United States are those for the Weather Bureau stations in the dry southwest. Yuma, Ariz., has a mean annual relative humidity of 42.9 per cent., with a mean monthly minimum of 34.7 per cent. in June. Santa Fé, N. M., has a mean annual of 44.8 per cent., with a mean monthly minimum of 28.7 per cent. in June. Pueblo, Colo., has a mean annual of 46.2 per cent., with a mean monthly minimum of 37.6 per cent. in April. Death Valley, Cal., was found to have a mean relative humidity of 23 per cent. during five months (May–September) of the year 1891, when a temporary meteorological station was maintained there by the United States Weather Bureau. During this same period the mean temperature was 94°.

In the dry interior of the great Eurasian continent we find the following relative humidities: Southwestern Siberia and western Turkestan have a mean of 45–50 per cent. in July. Yarkand, in eastern Turkestan, has a July mean of 47 per cent. In the arid region in the neighborhood of the Sea of Aral, Nukus (lat. 42.5°N., long, 59.6° E.), has a June mean of 46 per cent., and a 2 P.M. June mean of 19 per cent. Petro-Alexandrovsk, a degree and a half east of Nukus, in the desert (lat. 41.5°N., long. 61.1°E.), has a mean of 34 per cent. in June. Kasalinsk (lat. 45.8°N., long. 61.2°E.) has a mean of 45 per cent. in July. The air is still drier in the deserts near the equator. Ghadames, in Tripoli, has 27 per cent. in July, and 33 per cent. in August, and the Kufra Oasis has 27 per cent. in August, with a 3 P.M. August mean of 17 per cent. in September. In the Punjab and northwestern India, Lahore has 31 per cent., and Agra has 36 per cent. in May.†

These examples show clearly enough that the atmosphere of the room in which the observations above referred to were made was drier than that of many desert regions. That so dry an atmosphere is not healthy, especially in our winter climate, there is no need of argument to show. This low relative humidity means excessive evaporation from skin, lungs, and respiratory passages. Catarrhal and other throat difficulties may easily follow. Furthermore, the strain which is put upon the body in the rapid adjustment which it

* See chart of normal annual relative humidity in Report of Chief of Weather Bureau for 1896–1897.

† These data are taken from Hann's "Climatology," Vol. I., translated by R. DeC. Ward, and to be published during the present year by the Macmillan Company.

has to make when we go out from the high temperatures and desert aridity of our houses in winter into a temperature it may be 70°, 80°, or 90° lower, and a relative humidity of 70 per cent. to 100 per cent., is a greater one than we ought to repeat day after day, and many times a day.

The splitting and shrinking effects of the low relative humidity of our houses upon furniture and woodwork of various kinds are matters of common observation.

The present methods of heating our houses are wretchedly inadequate from the point of view of supplying sufficient moisture. Undoubtedly, the relative humidity of the air coming from an ordinary hot-air furnace may be somewhat increased by increasing the size or the number of the evaporating pans in the furnace, or by placing pans of water or some form of "humidifier," on, or, better still, within the registers.

That the temperature of our houses in winter is too high is generally acknowledged. But as long as the air indoors is so excessively dry, most persons are not comfortable unless the thermometer records about 70° or even higher. Were the air reasonably moist, we should be comfortable at temperatures of 65° or thereabouts. Dr. H. J. Barnes says that "a kitchen temperature of 65° is comfortable when the steaming teakettle imparts a reasonable amount of moisture to the air."

Observations of the relative humidity in school rooms may well be undertaken as a part of the instrumental work carried on in meteorology. Such indoor observations, coupled with similar ones made outdoors, furnish interesting material for comparison and discussion.

After the observations whose discussion forms the subject of this paper had been begun, I received from Dr. Henry J. Barnes, of Boston, a copy of an article by him, entitled "The Arid Atmosphere of Our Houses in Winter," published in the *Transactions of the American Public Health Association* for 1898. The relative humidity in Dr. Barnes' office, as determined by observations, with the Mason hygrometer, during seven days in January, 1896, was 27 per cent., while that of the outside air was 73 per cent. This humidity accords closely with that of 30 per cent. found in my study. Dr. Barnes' office was heated by hot-air furnace, with a water tank in the furnace evaporating from one to two pailfuls daily. In Dr. Barnes' paper mention is also made of the results of humidity observations within other buildings in Boston. These results are here tabulated for purposes of comparison:

Place and Time.	How Heated.	Mean Relative Humidity Indoors.	Mean Relative Humidity Outdoors.
City Hospital, 7 days, December, 1878.	Indirect steam.	29 per cent.	71 per cent.
Office of Dr. Barnes, 7 days, January, 1896.	Hot-air furnace.	27 "	73 "
Office of Dr. Ayer, 10 days, February, 1896.	Indirect steam.	36 "	70 "
Women's Hospital, 8 days, February, 1896.	Indirect steam.	24 "	71 "
City Hospital, 12 days, February and March, 1896.	Indirect steam.	38 "	74 "
Means.		31 per cent.	71 per cent.

The mean relative humidity indoors derived from these five sets of observations was 31 per cent., which is one per cent. higher than the mean obtained by me in my study. The mean relative humidity outdoors was 71 per cent., which corresponds to the outside humidity during my observations. By means of his "humidifier" which is placed over the register of a hot-air furnace in his office, Dr. Barnes has been able to obtain a mean relative humidity of 53 per cent. This humidifier evaporates on the average 4½ quarts of water daily, and Dr. Barnes has found that with this higher relative humidity his office is comfortable at a temperature of about 65°, whereas, without the artificial supply of moisture, a temperature of 70° to 71° was necessary to make the room comfortable.

THE SUBMARINE AND LAND TELEGRAPHS OF THE WORLD.

THE August Monthly Summary of Commerce and Finance contains a valuable article on the Submarine and Land Telegraphs of the World. The article shows "that the submarine telegraphs of the world number 1,750. Their aggregate length is nearly 200,000 miles; their total cost is estimated at $275,000,000, and the number of messages annually transmitted over them is more than 6,000,000. All the grand divisions of the earth are now connected by wires, and from country to country and island to island, the thoughts and words of mankind are instantaneously transmitted. Beneath all oceans save the Pacific the universal lan-

guage which this system has created flows uninterruptedly, and man talks as face to face with his fellowman at the antipodes. Darkest Africa now converses daily with enlightened Europe or America, and the great events in the morning are known in the evening throughout the inhabited world. Adding to the submarine lines the land-telegraph systems by which they are connected, and through which they bring interior points of the various continents into instantaneous communication, the total length of telegraph lines of the world is 1,180,000 miles, the length of their single wires or conductors 3,800,000 miles, and the total number of messages annually sent over them about 400,000,000, or an average of more than 1,000,000 each day.

In the short half century since the practicability of submarine telegraphy was demonstrated, the electric wires have invaded every ocean except the Pacific. Nearly a score of wires have been laid across the Atlantic, of which no less than thirteen now successfully operate between the United States and Europe, while three others span the comparatively short distance between South America and the African and South European coast lines. Throughout the Indian Ocean lines connect the Far East with Europe and America via the Red Sea, the Mediterranean, the western coast of Europe and the great trans-Atlantic lines. The Mediterranean is crossed and recrossed in its entire length and breadth by numerous cable lines, and the "Mediterranean of America," the Gulf of Mexico and the Carribbean Sea, is traversed in all directions by lines which bring its islands and colonies into speaking relations with each other and with South America, Central America, the United States, and thence with Europe, Africa, Asia—the whole world. Along the eastern coast of Asia, cable lines loop from port to port, and island to island, receiving messages overland from Eastern Europe via the Russia-Siberian land lines and forwarding them to Japan, China, Australia, New Zealand, the Straits Settlements, Hong Kong and the Philippines, and receiving others in return. South America is skirted with cable lines along the entire border save the extreme south, where they are brought into intercommunication by land lines. Along the entire coast of Africa cables loop from place to place and from colony to colony, stretching along the entire circumference and penetrating the interior by land lines at various points.

Every body of water lying between the inhabited portions of the earth, with the single exception of the Pacific Ocean, has been crossed and recrossed by submarine telegraph lines. Even that vast

expanse of water has been invaded along its margin, submarine wires stretching along its western border from Siberia to Australia, while its eastern borders are skirted with lines which stretch along the western coasts of the two Americas. Several adventurous pioneers in Pacific telegraphy have ventured to considerable distances and depths in that great ocean, one cable line running from Australia to New Zealand, a distance of over 1,000 miles, and another extending from Australia to the French colony of New Caledonia, 800 miles seaward. A cable which is to connect Canada with Australia across the Pacific is now being laid at the joint expense of the United Kingdom, Canada and the Australian Commonwealth, and has already been completed from Vancouver, British Columbia to Fanning Island, just south of the Hawaiian Islands, and it is expected that the entire line will be completed by the end of the present year.

The chief obstacle in the past to the construction of a grand trans-Pacific cable was found in the fact that midocean resting places could not be satisfactorily obtained or arranged for, no single government controlling a sufficient number of suitable landing places to make this seem practicable, in view of the belief that the distances through which messages could be sent and cables controlled was limited. With landing places at Hawaii, Wake Island, Guam, and the Philippines, however, no section of a cable stretching from the United States to Asia and touching at these points would have a length equal to that now in daily operation between France and the United States. The length of the French cable from Brest, France, to Cape Cod, Massachusetts, is 3,250 miles, while the greatest distance from land to land on the proposed Pacific route would be that from San Francisco to Hawaii, 2,089 miles; that from Hawaii to Wake Island being 2,040 miles, from Wake Island to Guam 1,290 miles, from Guam to Manila 1,520 miles, and from Manila to the Asiatic coast 630 miles. While the depth of the Pacific is somewhat greater than that at which any cable has been laid, the difference between its depth and the greatest depth reached by cables in the Atlantic would be very slight, the cable recently laid from Haiti to the Windward Islands being in 18,000 feet of water. The recent survey for a cable between the Pacific coast and Manila justifies the belief that a route can be selected in which the depth will not exceed 20,000 feet and may not exceed 18,000 feet. The recent survey made by the Bureau of Equipment, Navy Department, under the direction of Rear-Admiral R. B. Bradford, disclosed the greatest

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ocean depths heretofore known lying between Midway Island and Guam and being 31,614 feet, or but 66 feet short of six miles depth of water. This depression, however, which has been named the "Nero deep," in honor of the vessel from which the sounding was made, can be avoided by a detour, and it is believed that the necessary depth will not exceed 20,000 feet and may not be more than 18,000 feet.

GEOGRAPHY CURRENT

CLIMATOLOGY

Wheat-Growing in Semi-Arid Districts.—The utilization of every available acre of land for agriculture is a subject of vital importance to the welfare of a nation, and one which must more and more engage the attention of governments if the supply of bread stuffs is to keep pace with the increase of population. The United States Government has lately been engaged in conducting a series of experiments relative to wheat-growing in the semi-arid districts. The report of this work is embodied in a paper by Mark Alfred Carleton, in the Year Book of the Department of Agriculture for 1900, pp. 529–542. The semi-arid districts are referred by the writer "to that portion of the Great Plains lying between the ninety-ninth and one hundred and second meridians; to portions of eastern Washington and Oregon; and to those small portions of the Rocky Mountain and Basin States where crops are grown without irrigation." It has been found that the best varieties of wheat for these districts are the hard-gained, drought-resisting winter wheats, especially the Macaroni wheats. These varieties have been grown successfully in Russia under conditions more or less similar to those prevailing in the semi-arid region of the United States. One of the most important features resulting from this will be the creation of a larger market for macaroni, both at home and abroad. S. T.

HYDROGRAPHY

The Tocantins River.—*Le Mouvement Géographique* says that writers on geography are only just beginning to treat the Tocantins river of South America as an independent hydrographic basin. It should be added, however, that some of the latest geographical works still treat the Tocantins as a part of the Amazon system. A geog-

raphy recently published in England, for example, says that "the Tocantins forms a part of the Amazon system, being only divided from it by some islands." A British school geography, published last year, gives the area of the Amazon basin, and includes the Tocantins in it. Most of the French geographers, likewise, make the Tocantins a part of the Amazon system. M. Reclus, in his description of the Tocantins in the "Universal Geography," several years ago, treated the system as a distinct basin, and was one of the first geographical writers to give the correct idea of it. The river rises far to the south, has a tributary, the Araguaya, which is even larger than the Tocantins, and the joint streams form one of the great rivers of the continent, with a width, for a long distance, of two or three miles; but the river is so impeded by rapids that it is scarcely available for navigation until it widens into the great estuary on which Pará stands. It reaches the Atlantic about forty miles east of the nearest delta branch of the Amazon. Some water from the Amazon enters the Tocantins through several narrow arms of the Amazon delta; but this fact does not make the two rivers a part of the same system any more than the Cassiquiare, which unites the Orinoco and the Rio Negro, makes the Amazon and the Orinoco one hydrographic system.—*Bull. Am. Geog. Soc.*, XXXII., 2, 1900.

PHYTOGEOGRAPHY

Floriculture in New Jersey.—In the raising of flowers and foliage plants New Jersey is surpassed by few states. In 1899 the proprietors of 630 establishments reported flowers and foliage plants grown for the market, valued at $1,953,290. Of these proprietors, 494 made commercial floriculture their principal business, growing, in 1899, flowers and plants worth $1,893,839 and other products worth $66,719. They used 3,061 acres of land, valued at $2,174,865. The value of their buildings, including greenhouses, was $2,458,240, and in addition they had $156,249 invested in implements and $35,912 in live stock, making a total investment of $4,825,446. Their expenditures for labor in 1899 were $400,382 and for fertilizers, $48,334.

The comparatively large area of land under glass, 11,190,251 square feet, is due to the fact that many truck farmers use glass in growing early vegetables for the New York and Philadelphia markets. The 494 commercial florists report 6,195,903 square feet of glass surface, equivalent to 4,646,927 square feet of land under glass. In addition, there are 1,651 farmers who report a total area under glass of 6,543,324 square feet.—*Census Bulletin*, January 25, 1902.

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"Plant Agencies in the Formation of the Florida Keys" is the topic of an interesting short article by Charles L. Pollard published in the January number of the *Plant World*. In the region of the Florida Keys, the reefs are built largely through the agencies of the coral polyp, but plant agencies are necessary in order that enough soil may accumulate to make these regions habitable. The plant which usually initiates this process is the mangrove (*Rhizophora Mangle*) which is well adapted to becoming established on reefs that may be exposed only at low tide. The seed of this plant often begins germination before it is shed from the parent plant, and is thus readily able to avail itself of any advantage in location as it is being moved about by the water. When once established, this plant spreads rapidly and soon produces a thicket which catches and holds materials that help in building up a thin surface of fertile soil.

In a short time the new region becomes a growing place for other plants, which in their turn aid in the deposition of soil materials. Through these agencies and processes, the contour of islands, as given on the maps of a few years since, has been greatly changed, and new islands not represented on the maps have been introduced.

Although the soil on these islands is shallow, it is quite fertile and offers an excellent location for market gardens. A serious difficulty, however, in using the islands in this way arises in the fact that sufficiently rapid transportation for their products is not yet available. O. W. C.

The Florida Keys.—Many of the keys observed during our trip to this interesting region were surrounded by a belt of mangrove trees, some of the smaller ones being entirely given over to this particular tree, while others had the interior covered, as in the hammocks of the mainland, with hard-wood trees and shrubs and vines. The formation here, as on the mainland, is of coral origin, but the rock is even more prominent and accompanied by less soil. Nevertheless, the pine-apple industry is a flourishing one, many acres being under cultivation and devoted to the growth of this fruit. The slips are inserted in the cavities of the rock, with no attempt at arrangement, and make a wonderful growth. The scarcity of the soil, however, renders a prolonged use of a field impossible, on account of the early exhaustion of the soil, and a new clearing of land is made imperative. We were informed that the abandoned fields are soon recovered with a new growth of tropical vegetation, and at the expiration of a number of years become again available for cultivation.

Landings and collections were made on three of the keys, viz., Elliott's Key, Old Rhodes' Key, and Totten's Key. On all of them we found the uncleared portions heavily wooded, but, as in the hammocks on the mainland, very little herbaceous vegetation occurred. A peculiar feature of the vegetation, and one hardly to be expected as an associate with the hard-wood trees, is a species of *Cereus*. This was very common, its straggling 3-angled thorny stems sometimes attaining a length of twenty-five feet and sprawling on the ground or leaning on the surrounding vegetation. Another plant, quite in keeping with the *Cereus*, was a species of *Agave*, also of frequent occurrence. Insect life, represented by mosquitoes and highly ornate spiders, was very abundant, but of other animal life there was little; the almost entire absence of bird life made the silence of the woods intense.

In order properly to make this trip to the keys, it was necessary to secure a naphtha launch. The one we hired was about thirty-five feet long, and drew only three feet of water, but even with this light draft it was impossible in some cases to approach nearer than one half mile to the shore, on account of the exceeding shallowness of the water, and the services of a small flat-bottomed row-boat were at all times necessary to actually make a landing. The keys visited were at the extreme northern end of the chain. The vegetation seems to change considerably farther south, a number of palms making their appearance, so that a future visit to the more southern keys, including Key West and the Marquesas group west of it, and to the Thousand Islands on the west coast, visiting also the mainland, would undoubtedly prove interesting, and would surely yield much of value to the collections. To accomplish such a trip properly a launch of some size would be necessary, with sufficient storage room for quite a cargo. Many of the keys, and the Bahamas but a short distance east, probably contain botanical treasures which would be well worth securing. The palms, in particular, seem to be very local in their distribution.—*Jour. N. Y. Botanical Garden*, February, 1902.

Fruit Raising in Japan.—Fruit growing has not hitherto been an important industry in Japan, and when attempted, it has been as a side occupation of the farmer or gardener, there being few farms in which fruit forms the staple crop. Fruits originally cultivated, and probably native in Japan, include the orange, pear, peach, sour plum, almond, grape, persimmon, loquat, pomegranate, gingko or salisburia, and fig.

The "suykan," or Japanese sweet orange, is smaller, sweeter, and less juicy than the oranges raised in America, and the thin membrane separating the sections of the fruit is tougher; it has a very pleasant flavor, and is much used for food by both natives and foreigners. It is cultivated all through the warmer regions of Japan, and is the most plentiful of the fruits raised here, being found in the markets from early autumn until late the following spring. The country also produces an orange larger and more acid than the California product, and somewhat bitter. It is not much valued, and is produced in small quantities only.

The persimmon comes next to the orange in the number produced, and is a favorite with the natives, but its season is comparatively short. It closely resembles the persimmon of our Southern States. The sour plum is extensively cultivated and yields a good crop, but the other fruits named above, though more or less widely grown, are produced in much smaller quantities—the fig being most abundant and most valued of the less important fruits. The Government has introduced peaches, pears, and grapes from Europe and America, and has found the soil and climate well adapted to their production, so that these are now cultivated in addition to the native varieties of the same fruits.

Of the fruits wholly unknown in Japan until introduced from abroad, the apple has proved most successful, and it has become a chief product of some districts in the Hokkaido, or northern islands. The apples are of fine appearance and excellent flavor, and the trees yield a profit very encouraging to the cultivator, so that the area of their production is being increased. Cherries also have been introduced, but the fruit is inferior. However, the greater skill in cultivation which will come from longer experience may yet produce very satisfactory results. The native cherry tree produces a profusion of beautiful flowers, but no fruit, and the Japanese gardeners have cultivated it solely with reference to these, having developed a variety with clusters of large, double blossoms. Strawberries and other small fruits are raised by gardeners in the vicinity of the large cities, and the plants bear fruit of fine appearance, but little flavor.

The natives eat fruit chiefly fresh, and its use as a table diet is not general, although increasing. The processes of drying and canning fruits are beginning to come into use, but only as a means of preserving the fruit for home consumption, not for export.—*Consular Reports,* March, 1902.

ANTHROPOGEOGRAPHY

The City of Tananarivo, Madagascar.—Tananarivo (which in the vernacular means the "town of a thousand," alluding to the thousand Hovas who first garrisoned it) is an oblong city built on a granite rock like a huge hog's back, nearly two miles in length, standing among rice fields cultivated for centuries and irrigated with care. The villages as one approaches the capital reveal a complete change of race and a different mode of life from that seen among the tribes of the coast. The country houses are cubes of sun-dried bricks, with small apertures on the western sides, to avoid the east winds.

The foreign commerce of Tananarivo is carried on chiefly by the same firms that are established in Tamatave, and is almost confined to wholesale dealings in cottons. The population is dense, the climate relatively cool, and the people amenable to habits of cleanliness. No textile fabrics—except a few native lambas—are produced here, so that everything points to expansion in the cotton trade. The Hovas have adapted themselves to civilized customs and wear European clothing.

Perhaps no city of this size in the world is so lavishly endowed with churches, cathedrals, monasteries, chapels, schools, hospitals, etc., as is Tananarivo. There is a school of manual labor, where every branch of manufacture is taught, and many handsome specimens of work are shown.

As Tananarivo is built on a hill, locomotion is laborious. Round the base of the hill a magnificent esplanade, twelve miles in circumference, has been constructed, and this forms the city's broadway for carriages (of which only a very few exist), horses, and promenaders. Circulation over intermediate parts of the city must be made in filanjana, or chairs, the hire of which is regulated by a tariff, as with cabs at home; for, unless one be a trained athlete, walking is painful. A great many people use horses.

To the weekly market of Tananarivo the natives come from all directions, with every describable object for sale. The Hovas are essentially a race of barterers, and everything, according to them, is merchantable. The most scrupulous honesty is imperative. Formerly, any case of larceny was punished with immediate stoning to death. Now, of course, this barbarous custom is restrained by an efficient police force.

The salubrity of Tananarivo and the Imerina province in general is proverbial. The temperature never exceeds that of southern

Europe. On the coast, essentially tropical conditions prevail.—*Consular Reports*, February, 1902.

ECONOMIC GEOGRAPHY

Railway Building in 1901.—Railway construction in the United States throughout the year 1901 exceeded that of any previous year since 1890. The total length of line built was 5,057 miles, which, added to 194,321 miles, the estimated extent of trackage for 1900, brings the grand total up to 199,378 miles.

In the distribution of this railroad extension by States, Texas heads the list with 583 miles; Oklahoma follows with 428 miles; New Mexico, 375; Georgia, 303; Wisconsin, 196; Missouri, 189; Indiana, 174; Minnesota, 171; Illinois, 164; Michigan, 164; Louisiana, 160; Indian Territory, 157; Arkansas, 156; and Pennsylvania, 153 miles. No other States have increased their mileage within the year to the extent of 150 miles.

While the length of railways and the amount of freight tonnage have steadily increased with the expansion of the commercial interests of the country, the cost of freight transport has greatly decreased. According to figures given by the Bureau of Statistics, 1.24 cents per ton was charged in 1882 for transportation of freight; 1.03 cents in 1887; 0.93 cents in 1890; 0.84 cents in 1895; 0.80 cents in 1897; and 0.85 cents in 1900.—*Bull. Bur. Am. Rep.*, February, 1902.

The Future Possibilities of Siberia.—The world has now to deal with a new factor. Ten years ago, the name "Siberia" called up a picture of wastes of snow and ice, boundless tundras (steppes), and coasts white with icebergs. To-day, the same Siberia is a land filled with thriving villages of peasant farmers, producing grain and various vegetables. That great compeller of civilization, the railway, has broken down the bars between the world and Siberia.

Besides its countless resources of the soil, besides its rivers filled with valuable fish, and its forests inhabited by fur-bearing animals, Siberia is now beginning to show to the world its resources of gold, iron, copper, manganese, quicksilver, platinum, and coal, the yearly output of which is but a feeble index of what it will be when the deposits are developed.

In the past three years, several American mining engineers have traversed various parts of Siberia and central Asia. The testimony of these gentlemen is corroborated by that of other foreign engineers

who have visited the country—that the lack of exploitation of such evident mineral wealth as is found here is unparalleled in other parts of the civilized world. Of these resources, gold is by far the most important, as it is, curiously enough, the least developed. Taking the product of the Russian Empire approximately at $25,000,000 in gold per year, it seems comparatively insignificant. It places Russia fifth among the gold producers, and is but little more than the present annual gold output of the State of Colorado.

Prices paid for labor in Russia and Siberia are exceedingly low—from 15 cents to $1.50 per day, the laborers in every case feeding themselves out of their earnings. It will be asked why the variation in price is so great, and also how it is possible to hire miners for so little money. In the first place, the proximity or remoteness of centres of population and agriculture is responsible for the widely differing scales of wages. For example, in the region of the southern Urals, where much grain is raised and where the country is thickly settled, the labor of men and women at the placers is paid from 30 kopecks (15 cents) up to 70 kopecks (35 cents). In this region, the labor of a man with horse and cart costs but 45 cents per day of ten hours. This statement is vouched for by all who have collected economic figures of the district. In the northern Urals, the prices are about 25 per cent. higher. In central Siberia, men are contracted for by the year at $15 per month; while in northern and eastern Siberia, in the regions of intense cold, wages range from $1 to $1.50 per day, according to the remoteness of the mine from the centre of supply. Second, the reason of the cheapness of mining labor in Siberia is that the wants of the people are few. The workmen are of the peasant class, and it may be said that the larger proportion of them can neither read nor write. Their food consits of mutton, black bread, domestic fowls, eggs, milk, and tea. Most of the necessities of life are supplied by their own farms or gardens, and their purchases, besides tea, sugar, and vodka (the national stimulant), are few. Their clothes cost but little, and their enjoyments are usually limited to the celebration of the numerous civil and religious holidays by mutual visiting and the consumption, in greater or less quantities, of vodka. It will be a natural query if the labor supplied from such sources and nourished in so primitive a fashion is efficient. It is said that in no country can men be found who more cheerfully sustain the hard labor, privation, and sudden and severe changes of climate than the Russian and Siberian peasants. Witness, for example, the notably efficient service ren-

dered to the Russian army by the Cossacks, who are nourished and reared in the manner described above. No more hardy and enduring men can be found in any country. The bulk of the mining labor is Russian, while in the Urals many Tartars and Bashkirs are employed, and in eastern Siberia the miners consist, besides Siberian peasants, of Chinese and Manchu coolies.

Cities of from 10,000 to 50,000 inhabitants are now numerous in Siberia. Hotels supplied with comfortable rooms, restaurants which may truly be said in many cases to be palatial, electric lights, and telephone connections are not difficult to find. One may now traverse Siberia with his hands folded, if he so wishes, as the elegant weekly vestibule, supplied with bath, piano, dining saloon, drawing-room, leather sofas, easy chairs, and observation car—the whole fitted with electric lights and call bells—rolls from Moscow to Irkutsk. The cost of this remarkable journey of 3,200 miles, including sleeper, is but $44, first class.

To the majority of the inhabitants of St. Petersburg and Moscow, Siberia is as unknown as it is to the people of the mountain districts of Tennessee. When men of affairs in Moscow were asked what clothes to take to Siberia, they replied that furs were always necessary on account of the intense cold. Actual experience in the city of Krasnoyarsk showed that the thermometer registered 110° for days together in the month of August, and any clothes but those made of silk and linen were absolutely unendurable.

But let Siberia speak for herself; let the globe trotter get away from the Cook agencies for a month and see a new world, where elements of strength and virility soon to be felt in the struggle for existence are but waiting to develop under the touch of western enterprise. Some advance has already been made, as is evident when American mowing machines are seen rattling through the streets of Tomsk, and a policeman may be noted riding a United States bicycle through the dusty highways of Krasnoyarsk. The beginnings are small, but the straws blow with the wind of progress.—*Consular Reports*, January, 1902.

New Geographical Outlook for American Shipping.—Now that the problems of internal development are fairly well in hand, and the problems of international trade have begun to supersede them in the scale of national interests, the question of ships stands out in such relation to the national welfare as it never did before. It is not the same old question; it is a new question; new, because it rests on an

entirely new basis of a solid internal organization of economic activities. No one can compare our railway systems, our great national manufacturing industries, and our agriculture of to-day with their defective and disjointed organization and their absence of coördination and coöperation ten or fifteen years ago, without being impressed with the wonderful gains they have made in these respects. For the first time in our internal history foreign trade has a united economic organization back of it. Our productive and distributive interests coöperate on a juster basis than ever before. On this basis and with this backing shipbuilding faces its new geographical outlook.

The frontier of the United States measures 10,800 miles in length, 5,200 of which is coast line, fronting on the oceans and the Gulf of Mexico. Besides this there is a lake and river coast of 2,100 miles in length. The greater part of this water frontage of 7,300 miles is deep enough to admit of shipbuilding in some one or more of its several branches. But the naturally favored localities are those main inlets from the ocean, such as the Chesapeake and Delaware bays, on the Atlantic, and the bay of San Francisco and the Puget Sound, on the Pacific. In addition to these, the rivers of the Atlantic slope, in their approaches to the sea, afford some of the world's best locations for shipbuilding. American bays and rivers furthermore admit of much greater access to the interior from the ocean than is the case with possibly any other of the continents and countries of the world. Being thus exposed to the ocean on three sides, from numerous points on whose seaboard the interior of the country is reached by river, geographical conditions themselves afford to navigation unusual opportunities for activity.

The fact that the Great Lakes lie between the manufacturing East and the agricultural West adds another geographical condition favorable to the development of transportation by water. The rivers of the United States almost everywhere reach the ocean in such volume and depth of water as to admit of navigation far into the interior of the country from the ocean coast. The newly developing connection between the Great Lakes and the Atlantic Ocean by way of the Welland Canal emphasizes the closeness of the relation between the interior of the country and the ocean under existing geographical conditions. Deep ocean frontage and long interior waterways reaching from the Atlantic and the Gulf coasts far inward toward the Great Lakes, together with the three great inlets of the

Pacific at San Francisco, at Portland, and on the Puget Sound, these constitute the primary basis of the American shipping industry.

A second condition of geographical advantage in American shipbuilding is the convenient location of the materials for this particular industry. The fact that vast deposits of iron ore have been found within convenient reach of the Great Lakes has influenced the development of shipbuilding upon these waters through lowering the cost of raw material. Likewise the existence of timber in abundant quantities and extraordinary qualities on the Pacific coast, on the Lakes, and on the Gulf, has made possible the construction of coastwise, river, and harbor craft with a high degree of adaptation to local requirements.

A third geographical factor in American shipbuilding consists in the relation of the United States to its tropical possessions. These outlying possessions serve the purpose of an expanded frontier by thousands of miles, between which and the continental frontier ships are the only mode of communication. The addition of the political divisions of Hawaii, the Philippine Islands, Porto Rico, Tutuila, and Guam greatly enlarge the geographical basis on which the problem of commercial consolidation of the country and its possessions has to be worked out, because their possession alters our relation as a sea power to the rest of the world.

These three factors—deep water on seaboard, lakes, and rivers, the abundance of shipbuilding materials, and the widening by thousands of miles of the range of territorial responsibility of the United States—are the main geographical conditions underlying the life and development of our shipbuilding. All of these have conspired to change the relation of the United States to the rest of the world by that shrinkage of distances which has taken place through the invention of time-saving methods of propulsion by land and by sea. In commerce and navigation the effect of the application of steam to carriage and ship is analogous to the use of machinery in manufactures. In production, as in distribution, these inventions have so reduced the cost of putting commodities into the hands of consumers as to turn over the markets of the world to those nations alone which have adopted the economies of these methods.

As we have learned to reduce cost of production to supply our home market to greater advantage than others, so we are now obliged to reduce the cost of foreign distribution in order to enlarge our markets. On this account it is safe to say that the geographical enlargement of the responsibility of the United States is the most

potent factor in all our shipbuilding history. Only a few years ago it was the fashion to think of our national life as limited by the two oceans, the Great Lakes, and the Gulf of Mexico, within whose outlines it was assumed that our institutions and enterprises had ample range for development.

Geographical isolation was traditionally regarded as our natural heritage and destiny. Our destiny was deemed to be limited to working out an experiment in economic history by whose results the rest of the nations of the world might profit. Now, within a few years, we have advanced beyond the position of isolated observers of the world's work. As a continental power we have suddenly been forced by the logic of events from the traditional basis of isolated contentment into a position of maritime responsibility extending half-way around the globe. To-day the United States is a nation whose obligations are no longer continental, but oceanic, in scope. In this fact lies the new basis, and from this basis we get the new national outlook for the industry of shipbuilding.—*Monthly Summary of Commerce and Finance of U. S.*, December, 1901.

Current Articles on Commerce and Industry.*—African Gold Mining, *Engineering Magazine*, August.

Agriculture. A Giant Kansas Farm, *World's Work*, July.

Alaska, Gold Lands of Cape Nome, *Engineering Magazine*, July.

* For the convenience of the readers of the JOURNAL OF GEOGRAPHY, we print this month the full titles and the prices of the periodicals most frequently referred to in this current index.

The Commercial Bulletin, Boston, wk., $4.00, copy 10c. *The Manufacturer*, Philadelphia, s.-mo., $3.00, copy 15c. *Engineering and Mining Journal*, New York, wk., $5.00, copy 15c. *Stoves and Hardware Reporter*, St. Louis and Chicago, wk., $1.00, copy 5c. *Country Life in America*, New York, mo., $3.00, copy 25c. *American Agriculturist*, New York, wk., $1.00, copy 5c. *Scientific American*, New York, wk., $3.00, copy 8c. *Harper's Weekly*, New York, wk., $4.00, copy 10c. *The Southern Field*, Washington, mo.; published by the Southern Railway, gratis. *Bradstreet's*, New York, wk., $5.00, copy 10c. *Crop Reporter*, Washington, mo.; published by the Secretary of Agriculture, gratis, circulation restricted. *The Textile Record of America*, Philadelphia, mo., $3.00, copy 25c. *American Trade*, Philadelphia, s.-mo., gratis; organ of the Nat'l Ass. of Manufacturers of the U. S. *Commercial Bulletin and Northwest Trade*, Minneapolis, wk., $2.00, copy 10c. *Hide and Leather*, Chicago, wk., $3.00, copy 10c. *Paint, Oil and Drug Review*, Chicago, wk., $2.00, copy 10c. *The Miss. Valley Lumberman*, Minneapolis, wk., $2.50, copy 10c. *The Engineering Magazine*, New York, mo., $3.00, copy 25c. *The American Monthly Review of Reviews*, New York, mo., $2.50, copy 25c. *The World To-Day*, Chicago, mo., $3.00, copy 25c. *The Clay Worker*, Indianapolis, mo., $2.00, copy 20c. *Monthly Sum-*

Argentine Republic, *Bulletin of Bureau of American Republics*, June.

Brazil, *Bulletin of Bureau of American Republics*, June.

Brazil, Trade Conditions in, *Consular Reports*, August.

Cables, Submarine of the World (with map), *World's Work*, July.

Canada, The Development of, *Consular Reports*, July.

Canal, Development of Sault Ste. Marie, *Scientific American*, June 21.

Catskills, Dwellers among, *Harper's Weekly*, June 21.

China (and Manchuria), Trade in, *Consular Reports*, July.

Cities, American of To-day, *Mahin's Magazine*, June.

Coal Mining, *The World To-Day*, August.

Commerce, United States Foreign, *The Manufacturer*, June 16.

Commerce, United States Foreign (annual official review), *Monthly Summary of Commerce and Finance*, Treasury Department, June.

Commercial Expansion, Will it Continue, *World's Work*, August.

Costa Rica, Gold Mines, *Engineering and Mining Journal*, August 16.

Cuba, Industrial and Commercial Conditions, *Review of Reviews*, August.

Cuba, Labor Conditions in, *Bulletin of Department of Labor*, July.

Cuba, Clay Industries of, *Clay Worker*, June.

Farm, Day's Work on a New England, *Everybody's Magazine*, August.

Fiji and the Fijians, *Scientific American*, June 28.

Forests of the Pacific, *Harper's Weekly*, June 28.

Germany, American Trade with, *Consular Reports*, June.

Gold and Silver: World Production in 1901, *Engineering and Mining Journal*, July 5.

Gold Regions of Arizona, *Engineering and Mining Journal*, June 7.

Grocery Trade in France, *Commercial Bulletin and N. W. Trade*, August 9.

Handwork, Revival of Skilled, *World's Work*, July.

Irrigation in Arizona Desert, *Harper's Weekly*, June 21.

Isthmian Canal Decision, *Engineering Magazine*, August.

mary of Commerce and Finance, Washington, mo., gratis; published by the Bureau of Statistics of the Treasury Department. *The New York Commercial*, New York, daily, $5.00, copy 2c. *The New York Price Current*, New York, daily, $5.00, copy 3c. *The World's Work*, New York, mo., $3.00, copy 25c. *Consular Reports*, Washington, mo., gratis; published by the Bureau of Foreign Commerce of the Department of State.

Leather Industry of Salem and Danvers, *Hide and Leather*, August 9.
Lithographic Stone of Kentucky, *Engineering and Mining Journal*, June 28.
Locomotive Building, *Scientific American*, August 23.
Northwest, The Great, *The World To-day*, July.
Packing Industry of Chicago, *Scientific American*, June 28.
Petroleum in 1901, *Bradstreet's*, June 28.
Petroleum in Russia (with map), *Consular Reports*, June.
Prices, Tending Lower, *Bradstreet's*, July 12.
Redwood Lumber Plant, *Scientific American*, August 2.
Resorts, A Commonwealth of (Vermont), *World's Work*, August.
Rice Farming in the South, *Review of Reviews*, August.
San Francisco (special number), *Harper's Weekly*, June 28.
Silk Raising and Manufacturing, *Textile Record*, June, July and August numbers.
Silk Culture in America, *Scientific American*, June 21.
Summer People Industry (New Hampshire), *World's Work*, August.
Telegraph, The Printing, *Everybody's Magazine*, July.
Tin Mining (Cornwall), *Engineering and Mining Journal*, August 9.
Transportation, Social Effects of, *Annals of American Academy of Political and Social Science*, July.
Waterways, Effects on Railroads, *Engineering Magazine*, July.
Waterways, Interior of the United States (with map), *American Agriculturist*, July 5. E. D. J.

GEOGRAPHY TEACHING

The Relation of Geography and History.—Miss Lucy M. Salmon, Professor of History at Vassar College, prepared a paper on "Some Principles in the Teaching of History," for discussion at the recent meeting of the National Society for the Scientific Study of Education.

Among many of the topics treated in a concise and scholarly way is that of the relation of history to geography, which is summarized as follows:

"The subject of geography presents many difficulties not only because of its vastness, but also through the indefiniteness of its limits. The great branches of physical, political, and commercial geography are each sufficiently comprehensive to be considered a subject by itself, yet each is so interwoven with the other that it is impossible to make any division between them. 'History is not intelligible without geography,'* and this statement from one of

* H. B. George, "History and Geography," p. 1.

the best authorities on the relation between the two subjects must be accepted as covering all the different phases of geography.

"The dependence of history upon the physical character of a country is evident when it is seen to what extent these conditions have determined those on which history is based. The beginnings of nations have been influenced by the existence of broad fertile valleys, while very high or very broad mountain chains have, outside of America, decided national frontiers. The necessity for individual protection determined the sites of the hill fortress-towns of ancient Greece and of mediæval Italy, as protection has again led to the choice of sites partly encircled by water, as Durham, Venice, Bern, and Constantinople; the necessity for national defence has developed the great modern fortress-towns of Grenoble and Belfort; commercial reasons have placed towns at the junction of two rivers, as Mainz, Coblenz, and Lyons, or near the mouth of rivers, as Philadelphia, New Orleans, and Havre.* Trade routes, military operations and terms of treaties have all been conditioned by geographical features.

"Geographical nomenclature is in its turn a fruitful field for showing the relation of history and of geography, as is evident in the term 'fossil history' that has been applied to it. Great erudition has been required to determine satisfactorily and conclusively the origin of large numbers of European geographical terms; but the problem in America is simpler than it has been in Europe, and it is far simpler here to-day than it will be in the future. It is possible almost to reconstruct the early external history of America through the study of names. The Spaniards have left the traces of their explorations and discoveries in the names of saints and in names significant of the natural features of the country, and these are found all along the seacoast and the watercourses of the Southwest. The French discoverers in their turn have left along the Great Lakes and through the valleys of the St. Lawrence and the Mississippi the names of French explorers, occasionally of saints, more often those indicative of the physical conditions of the country. The English settlers introduced a new element in nomenclature that had been impossible for the Spanish and the French in view of the great extent of territory explored, and consequent lack of permanence, and that was names showing the affection of the settlers for their native

* Mr. George has given an entire chapter to the location of towns and I am indebted to him for the illustration of Belfort.

English towns—hence the duplication all along the Atlantic coast of the geographical names of England.*

"After the separation of the colonies from England, dawning Americanism is seen in the names Columbus, Washington, Hamilton, Jefferson, and those of other statesmen and leaders. Later, the same spirit developed Websters, Clays, Grants, and Garfields. American history is thus stratified in its geographical names. The love of native home that led to the conferring of so many names of England on the Atlantic settlements was reproduced when the descendants of these settlers became in turn emigrants to the western country.† Adventurers have left their footprints in Fair Chance, Eureka and Oka (softened from O. K.). 'Boomers' have left their impression on Paris, London, Mason City, Charles City, and Metropolis City. The hopes and aspirations of the comers are seen in Concord, Liberty, New Era, and Unionville. Vaulting ambition has sprinkled over central New York most of the classical names of Greece and ancient Italy, while Sparta appears in Wisconsin, and Hannibal in Missouri. A score of additional classifications of American names might be made showing how history has left its impress on American geography.

"If we turn again to Europe, we see how the development in methods of warfare has changed the entire system of the defence of towns. The mediæval city walls, encircling narrow crowded streets whose buildings were prophetic of the tall apartment houses of to-day, have given place to broad boulevards that are indicative of peace. Evolution in the site of towns has produced successively the Grecian acropolis, the Italian hill castle, the English manufacturing town, and the American railroad centre.

"These are but suggestions of the innumerable ways in which history and geography each supplement and explain the other. The immediate relations between the two subjects are more obvious than is the case with numismatics and history, yet in this very apparent simplicity of relationship there lurks a danger. About no class of facts and conditions is it so easy to generalize from insufficient data

* It is interesting, however, to note that this apparently did not come until after the period reflecting court influence, as is seen in the names Virginia, Maryland, New Jersey. When the actual settlers grew in independence, they gave the names of their home towns.

† Jersey Shore, Pa., Salina, Kansas,—the frequent repetition of names like Oswego, Brooklyn, Rochester, all show the influence of inter-state migration, as Penn Yan and Beloit show the compromise between settlers from different sections or holding different views.

as about those relating to geography.* The novice who would hesitate to formulate conclusions in regard to the connection between archæology and history, or heraldry and history, does not hesitate to draw sweeping deductions concerning the apparent mutual influence of geography and history. The teacher must be well equipped with a fund of geographical and historical knowledge, rather than familiar with only technical method, if he is to hold in check this too common tendency.''

Geography at the State Normal School, New Paltz, N. Y.—One of the most interesting features in the revival of geography work at New Paltz is the seminar in advanced geography conducted by Doctor Margaret K. Smith, who is also director of the laboratory of experimental psychology in the school. This seminar has been at work for several months and consists of twenty-three members, eight young women and fifteen young men. Membership is regulated by the seminar itself. New members are chosen by majority vote of the seminar. Those are eligible who are members of the class in geography methods, and who stand exceptionally well in class work as well as in examinations. Students who have taught for at least five years may be admitted by vote of the seminar without being members of the class in geography. Only earnest and mature students are taken into membership. They average at this time more than twenty-two years of age and are therefore as mature as those who are just graduating from college. Meetings are held on Friday afternoon from 2:30 until 4:30 and are presided over by the members in turn.

To cover as many phases of research as possible the work of the seminar is divided in such a way that certain members take charge of certain subjects or departments of research. For instance, one of the young men has taken up the study of the variation of the magnetic needle. Two others are occupied entirely with governmental geography, that is, with the action of governments in regard to canals, harbors, coast lighting, signals at sea, etc. Two of the students are charged with the duty of bringing before the seminar digests of the contents of the *National Geographical Magazine*. Two others are responsible for summarizing for the seminar current geographical news and discussions from the JOURNAL OF GEOGRAPHY.

* One illustration of this is the frequent insistence on the idea that the sea and the mountains are the natural homes of liberty, a statement repeatedly met with in the older text-books on history. Mr. George advances the ingenious theory that the statement owes its vitality to Wordsworth's sonnet. P. 74.

A secretary makes a record of papers presented, of discussions, and also of important items of information. Eventually the seminar will doubtless collaborate with students of geography elsewhere.

M. T. S.

Observational and Field Work as the Basis of the Teaching of Geography.—At the Teachers' Guild Conference on January 13, Miss J. B. Reynolds opened the discussion by emphasizing the need of giving children the power to obtain geographical knowledge for themselves by teaching them how to make and record observations on geographical phenomena. She then laid stress on the following points:

1. Children should be trained to observe the actual forces and features of nature *before* studying cartographic or other record of them. Observational work is systematically carried on out-of-doors by some schools in connection with the study of the home district, and partly indoors by others by means of object lessons.

2. Field and observational work is not to be confined to elementary stages of geographical study. It is also essential in the most advanced work. It is needed even when the child is studying lands too remote for personal observation in order that foreign geographical phenomena may be realized by comparison or contrast with those of the neighborhood, and the theories of the text-book be put to the test of practical observation and experiment. It is only also with increasing years and increased knowledge of various arts and sciences that a child can understand a great deal of the phenomena around him, and so derive the greatest benefit from his observations.

3. The field-work is broadly divisible into three stages:

(*a*) The familiarizing of the mind with the different typical forms presented by the Earth's crust.

(*b*) The acquirement of the habit of comparing together the infinite variety of these forms, and of referring them to their underlying causes in the forces of nature.

(*c*) The further acquirement of such knowledge of the successive steps in the interaction of these forces as will enable the student in some measure to read the past history of geographical features, and to forecast their future.

4. That it is desirable to give children very definite training in forming deductions from observation of maps, pictures, and other records of geographical phenomena, and this work necessitates a generous supply of apparatus, more particularly of maps of the world showing the chief geographical distributions.

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5. Before observational and field-work can be very widely adopted in the upper classes of schools, they must obtain larger recognition than is now the case in public examinations, and the teacher of geography must enjoy the same facilities for study and the same rewards for his labor as he would if he devoted himself to any other branch of science.

Mr. Lyde entirely agreed with Miss Reynolds as to the value of observational work, but was strongly opposed to field work as the *basis* of geographical teaching, at all events for boys, because most teachers could not afford time to make it regular, and because boys regarded it as a picnic. Her suggestions might be useful as complementary, but the basis of the teaching must be regular and must be what the boys regarded as business. He also thought that there was a tendency now-a-days to teach too much through the eye at the ultimate expense of the imagination, and to make the road to knowledge appear too easy—a source of some disgust or contempt with the present boys. The best teachers were specialists not in geography or in any other subject; but in teaching; and, in drawing out a boy's mental power, you saved time by starting from what he was already interested in—which, in the case of most boys, was commercial geography—railways, ships, apples, etc. Mr. Lyde explained the importance of making the boys draw constantly on the blackboard, and much preferred educational museums collected by the class and always before their eyes to occasional field work of a geological kind. —*Geographical Teacher,* Vol. 1, No. 2.

GEOGRAPHIC LITERATURE

BOOK REVIEWS.

Educational Foundations of Trade and Industry.—Fabian Ware. 7 x 4½ in. New York, D. Appleton & Co., 1901. Pp. xiv + 300. Price, $1.20.

Mr. Ware is an English scholar of reputation who has already given us one or two treatises on education. In this study, the full title of which is given above, he presents, primarily as a protest to English inaction and inertia otherwise called conservatism, a statement of the vital relation between education and national supremacy in trade and industry. He treats of the rise of national systems of education in Germany, France and America, and of the causes determining the different development in the three countries. Furthermore he is constantly, in this exposition, making comment on the absence and the need of a national system in England.

He shows very clearly that Germany's supremacy has closely followed an avowed effort to give all the people a common school education, and as many as possible a higher education. In the development of such a system State control has been necessary, and the State has always taken the advice of experts in pedagogical science. The whole trend of development of commercial Germany has been a gradual solution of the one great question "What is worth while in education?" and the gradual demonstration that that education is of most worth which fits men for the lives they have to live. This is the decision which has established technological and trade schools, and has put their curricula on an equal footing with the old mediæval ideals of education.

To equip pupils for courses in science and commerce, the whole secondary and elementary systems have been subject to supervision and revision. And all through the century just passed the success attained by the nations in commerce and industry has been proportional to the retirement of the classics from the preëminence of mediæval times, and to the elevation of the sciences and the modern languages.

This rearrangement of ideals has gone farthest in Germany, and it is to this that we owe the supremacy of Germany in almost all the chemical industries, and her paramount position in electricity and several other lines. It is this rearrangement of ideals which has made Germany lead the world in geography. When we realize that in German speaking lands there are 112 instructors of university grade devoting their attention to geography, and compare this with the half dozen of Great Britain, and the handful in America, we can see that geography comes to her own when a nation has taken a sane decision as to what kind of education pays as a national investment.

The book is a welcome addition to the working material of the growing geography teacher. Not that the subject of geography is treated at all in its pages, but because the essentials for the education of the masses are here discussed and this group of essentials involves geography as an important member.

J. P. G.

Observations and Exercises on the Weather.—Laboratory Work in Physical Geography and Meteorology by James A. Price, A.M., Instructor in Physiography in the Fort Wayne High School, Indiana. 10 x 8 in. New York, American Book Co., 1902. Pp. 60. Price, 30 cents.

Mr. Price's Observations and Exercises on the Weather is an attempt to provide a laboratory manual for meteorology, and hence "Physical Geography" in the subtitle is misleading. The book consists first, of twelve blank pages, ruled to take observations on the weather elements for forty days. Vertical columns subdivide the record into fifty-six separate entries. Then follow four pages of symbols to facilitate entry; and the rest of the space is given up to questions to be answered from the data recorded on the preceding pages. The author takes an unwarranted liberty in suppressing the word "anti-cyclone," making his cyclone run from the centre of one anti-cyclone to the centre of the opposite one. Some of the questions will call for thought, and may be answered properly enough from the data of any chance forty days. But it is an open question if it is a good plan to ask a student to base an answer to many of these questions on so slender a record.

J. P. G.

Harriman Alaska Expedition.—Two volumes. 10 x 7 in. New York. Doubleday, Page & Co., 1901. Pp. xlii + 184–200; 15 landscapes in color lithography, 25 color lithographs of birds, mammals and flowers, 85 photogravures, all full-page; 240 pen drawings in the text, and 5 maps. Text by John Burroughs and eleven others. Price, $15.

In two superb volumes we have the story of a cruise in Alaskan waters, of a party of eminent specialists in various natural history lines, spending a vacation in active field work, under ideal conditions.

In the spring of 1899 Mr. Edward H. Harriman, of New York, planned an expedition to Alaska for himself and family, and the better to occupy the large steamer chartered, and to have congenial company, "he invited as his guests, three artists and twenty-five men of science, representing various branches of research, and including well known professors in universities on both sides of the continent, and leaders in several branches of Government scientific work." The expedition sailed from Seattle May 30, on the steamer "Geo. W. Elder," and was gone two months. The route lay along the inside passage to Juneau and Lynn canal, then skirted the coast to the west, stopping at many places, at Kadiak island, the Shumagins, the Aleutians, the Pribylofs, and St. Lawrence, touching at the coast of Siberia, and at Port Clarence, near Cape Nome and then homeward.

Large collections of all sorts were made by the various specialists, and these are being worked up for publication in additional volumes for purely scientific record. Already over thirteen genera and about six hundred species new to science have been described. Corrections were made in the charting of the coast, new glaciers and fiords were discovered and named.

The equipment for the journey was very generous, "including naptha launches, small boats and canoes, camping outfits, stenographers, photographers, and extra men for oarsmen and helpers.

The professional photographers and several amateurs were busy, and over five thousand photographs were taken.

The first volume opens with a fine map of the United States and of Alaska, on the same sheet and drawn to the same scale, showing the route of the party, going and coming. Then the narrative of the journey is told by John Burroughs, in his most entertaining style, and no one can read it without continually rejoicing with the writer in the fascination and the beauty of this new world opened up to him. Professor John Muir follows with a fine account of the glaciers of Alaska, and no one is better posted on this subject than he. Mr. George Bird Grinnell gives a short account of the natives of the Alaska coast region, with their curious boats and houses, their skill in wood work, and basketry. Very interesting is the account of the village of New Metlakahtla, and the splendid work of civilization which the missionary, Mr. Duncan has wrought. Mr. Burroughs too, dwells with loving approval on the sober, industrious and religious folk, who now live in good houses, dress in good clothes, go to church on Sunday, in a building they have made themselves, seating nine hundred persons, and of architecture that would be considered artistic in any land.

A chapter on The Discovery and Exploration of Alaska, by William Healey Dall is very interesting and complete. Days Among Alaska Birds by Charles Keeler is equally fine, and the illustrations are superb. The drawings and

paintings of the birds are by Louis Agassiz Fuertes, and are magnificent specimens of artistic drawing and color lithography. Mr. B. E. Fernow gives a chapter on the Forests of Alaska, and accompanies it with a fine map. Mr. Henry Gannett writes a chapter on the General Geography of Alaska, and Professor W. H. Brewer an article on the Atmosphere of Alaska. Dr. C. Hart Merriam writes of Bogoslov, our newest volcano, and Mr. G. K. Gilbert adds a note on the physical history of Bogoslov. The Salmon Industry is graphically described by George Bird Grinnell, and M. L. Washburn tells how several of the islands have been utilized as fox farms, and the blue fox now bred as a domesticated animal, so producing a constant supply in the fur trade.

In illustration the work is magnificent. There is scarcely a page without a pen drawing or more in the text, and every few pages there is an inset of a page plate in color lithography or in photogravure, so daintily engraved and so finely printed as to vie in excellence with the finest quality of platinum or carbon photographs.

Taken entire it is a sumptuous work, and every teacher and student is to be congratulated who has the privilege of turning the pages and enjoying the feast. J. P. G.

A Laboratory Manual of Botany.—Outlines and Directions for Laboratory and Field Work in Botany in Secondary Schools. Otis W. Caldwell, Ph.D., Professor of Botany in the Eastern Illinois State Normal School. 7½ x 5 in. New York, D. Appleton & Co., 1902.

There is a vital bond between geography and botany, and the best progress made in recent years, in botanical study is in the line called ecology, in which the emphasis is centered on the interrelation between plant and environment. The newer botany becomes a study of plant evolution, as over against plant classification. This work has made much more progress in the universities of Germany than it has in America, but in certain centres in this country much advance has been made. One of the younger generation of botanists with the wider horizon is the author of the book under review, and his "Laboratory Manual" is an aggressive advance along these sane and thought-stimulating lines. It is such a work as Dr. Caldwell is doing, that emphasizes the natural correlation possible between the natural sciences. It is this kind of coöperation which will enrich both botany and geography.

The manual is planned to meet the needs of the large army of high school teachers and students, and the author has wisely made his lessons very specific, proposing an ample list of materials from which choice may be made as conditions may determine, and calling for special attention to essentials in the broad sweep of the whole plant kingdom. To do this it has been necessary to go over some ground that has already been worked over in the grade lessons, but the author has not hesitated to give what is necessary to a well rounded presentation, and he has succeeded well. The book is timely, it is up to date, and deserves a wide popularity. J. P. G.

Grammar School Geography.—Alexis Everett Frye, recently Superintendent of Schools of Cuba. Large quarto, cloth. Boston, Ginn & Company, 1902. Pp. viii + 195 and 8. List price, $1.25.

Frye's Grammar School Geography is of the same scope as his Complete Geography of several years ago. The value of a text-book in geography is determined by its text, its pictures and its maps.

The language of the *text* in question is clear, simple and direct. The sentences are short and within the comprehension of the pupils for whom it is written. In choice of material, the author recognizes the present tendency of the best geographic teaching by simplifying the treatment of the physical features of the earth and placing additional emphasis on the industries. The book is written with the central idea that "Geography is the study of the earth as the home of man." This leads the author to treat physical features and climate as related to man and his industries. The artificial divisions of the subject into *mathematical, physical, political*, etc., thus disappear and every lesson becomes a lesson in *geography*.

In the new book a brief study of the continents and oceans is followed by a detailed study of North America and the United States, then comes a more complete study of the continents. This method makes better use of the pupil's experience and knowledge than the detailed treatment of the continents before the United States as in the older book. The new possessions of the United States are adequately treated.

The *pictures* are numerous, well chosen to illustrate the various phases of geography and well reproduced. The *maps* are numerous and well executed. Globe maps on a uniform scale give correct proportions, and keep the globe idea of the earth constantly in the mind of the pupil. The first series of maps of the continents is also drawn to a uniform scale. The numerous relief maps and the product maps of the United States are excellent and of great teaching value. The full-page political maps are clear and very complete.

The book is a valuable addition to geographic text-books, and will prove very helpful as a reference book in connection with any other text.

D. C. R.